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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/944,903	08/30/2001	Ammar Derraa	MICRON.240A	3895

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EXAMINER

Mandala, Victor A

ART UNIT	PAPER NUMBER
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2826

DATE MAILED: 10/29/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/944,903	Applicant(s) DERRAA ET AL.	
	Examiner Victor A Mandala Jr.	Art Unit 2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1. Claims 1-18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear what the limitation, substantial, in claim 1 and 10 is meant by.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 4-5, & 7-8 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S.

Patent No. 5,312,774 Nakamura et al.

2. Referring to claim 1, an integrated circuit, comprising: a silicon substrate, (Figure 2 #10); an insulating layer, (Figure 2 #20), formed on an upper surface of the substrate, (Figure 2 #10), wherein a contact opening is formed in the insulating layer, (Figure 2 #20), wherein the contact opening extends from an upper surface of the insulating layer, (Figure 2 #20), to the upper

surface of the substrate, (Figure 2 #10); a conductive contact deposited in the opening in a manner such that the conductive contact, (Figure 2 #40'), directly contacts the upper surface of the substrate, (Figure 2 #10), wherein the conductive contact, (Figure 2 #40'), comprises a titanium layer interspersed with titanium silicide, (Figure 2 #40'), where in a **substantial** portion of the titanium silicide is interspersed in the titanium prior to depositing in the opening, (Col. 5 Lines 63-68 and Col. 6 Lines 17-20); a conductive contact fill, (Figure 2 examiner's label #100), deposited on an upper surface of the conductive contact, (Figure 2 #40'), in a manner such that the contact fill, (Figure 2 examiner's label #100), fills **substantially** the entire contact opening, wherein the contact fill, (Figure 2 examiner's label #100), comprises titanium nitride, (Figure 2 examiner's label #100).

3. Referring to claim 4, an integrated circuit, wherein the contact opening has an aspect ratio of at least 10:1, (Col. 4 Lines 32-33).

4. Referring to claim 5, an integrated circuit, wherein the upper surface of the substrate, (Figure 2 #10), comprises a junction region, (Figure 2 examiner's label #200).

5. Referring to claim 7, an integrated circuit, wherein the titanium silicide in the titanium layer, (Figure 2 #40'), provides low resistance electrical contacts between the junction region, (Figure 2 examiner's label #200), and the silicon substrate, (Figure 2 #10).

6. Referring to claim 8, an integrated circuit, wherein the titanium rich titanium silicide layer, (Figure 5 #71 & Col. 6 Line 50), is deposited over the upper surface of the insulating layer, (Figure 5 #70).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2-3, 6, & 9-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,312,774 Nakamura et al.

7. Referring to claim 2, an integrated circuit, wherein the titanium layer interspersed with titanium silicide, (Figure 2 #40'), is approximately 50A to 150A thick.

Nakamura et al. teaches the claimed invention in claim 3 except for the exact measurements of the thickness of the titanium layer interspersed with titanium silicide as claimed by the Applicant.

Note that the specification contains no disclosure of either the critical nature of the claimed dimensions or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

8. Referring to claim 3, an integrated circuit, wherein the titanium layer interspersed with titanium silicide, (Figure 2 #40' & Col. 5 Lines 63-68 and Col. 6 Lines 17-20), comprises approximately 10 % silicon.

Nakamura et al. teaches the claimed invention in claim 3 except for the exact measurements of amount of Silicon that was diffused with the titanium layer as claimed by the Applicant.

Note that the specification contains no disclosure of either the critical nature of the claimed dimensions or any unexpected results arising therefrom. Where patentability is said to be based

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upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

9. Referring to claim 6, an integrated circuit, wherein the junction region is less than about 1 μm deep.

Nakamura et al. teaches the claimed invention in claim 3 except for the exact measurements of the thickness of the junction region as claimed by the Applicant.

Note that the specification contains no disclosure of either the critical nature of the claimed dimensions or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

10. Referring to claim 10, a contact structure having a contact opening formed over a junction region, (Figure 2 examiner's label #200), in a silicon substrate, (Figure 2 #10), comprising: a conductive contact layer, (Figure 2 #40'), comprising titanium interspersed with titanium silicide, (Col. 5 Lines 63-68 and Col. 6 Lines 17-20), wherein the conductive contact layer, (Figure 2 #40'), is deposited directly on an upper surface of the silicon substrate, (Figure 2 #10), over the junction region, (Figure 2 examiner's label #200), wherein the titanium silicide in the conductive contact layer, (Figure 2 #40'), reduces consumption of silicon from the junction region, (Figure 2 examiner's label #200), during silicidation reaction between silicon in the substrate, (Figure 2 #10), and the titanium in the conductive contact layer, (Figure 2 #40'); a diffusion barrier layer, (Figure 2 examiner's label #100 and see ** below), formed on an upper surface of the conductive contact layer, (Figure 2 #40'); a contact fill, (Figure 1 examiner's label #100), formed on an upper surface of the diffusion barrier layer, (Figure 2 examiner's label #100 and see ** below), wherein the contact fill comprises titanium nitride, (Figure 2 examiner's label #100), wherein the titanium nitride fills **substantially** the entire contact opening, (Figure 2 #30).

****** Initially, it is noted that the 35 U.S.C. § 103 rejection based on a barrier layer and a TiN layer deals with an issue (i.e., the integration of multiple pieces into one piece or conversely, using multiple pieces in replacing a single piece) that has been previously decided by the courts.

In Howard v. Detroit Stove Works 150 U.S. 164 (1893), the Court held, "it involves no invention to cast in one piece an article which has formerly been cast in two pieces and put together...."

In In re Larson 144 USPQ 347 (CCPA 1965), the term "integral" did not define over a multi-piece structure secured as a single unit. More importantly, the court went further and stated, "we are inclined to agree with the solicitor that the use of a one-piece construction instead of the [multi-piece] structure disclosed in Tuttle et al. would be merely a matter of obvious engineering choice" (bracketed material added). The court cited In re Fridolph for support.

In re Fridolph 135 USPQ 319 (CCPA 1962) deals with submitted affidavits relating to this issue. The underlying issue in In re Fridolph was related to the end result of making a multi-piece structure into a one-piece structure. Generally, favorable patentable weight was accorded if the one-piece structure yielded results not expected from the modification of the two-piece structure into a single piece structure.

Therefore, it would have been obvious to one of ordinary skill in the art to use the barrier layer and the TiN layer as one layer as "merely a matter of obvious engineering choice" as set forth in the above case law. The Applicant also claims that the barrier layer is also made out of TiN as stated in claim 12.

11. Referring to claim 11, a contact structure, wherein the junction region is less than about 1 μm deep.

Nakamura et al. teaches the claimed invention in claim 3 except for the exact measurements of the thickness of the junction region as claimed by the Applicant. Note that the specification contains no disclosure of either the critical nature of the claimed dimensions or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

12. Referring to claim 12, a contact structure, wherein the diffusion barrier layer comprises titanium nitride, (Figure 2 #100 and see ** above).

13. Claims 9, and 13-18 are product by process claims and the applicant elected for the device filed on 8-23-02.

Initially, and with respect to claims 9, and 13-18, note that a "product by process" claim is directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); In re Fitzgerald, 205 USPQ 594, 596 (CCPA); In re Marosi et al., 218 USPQ 289 (CAFC); and most recently, In re Thorpe et al., 227 USPQ 964 (CAFC, 1985) all of which make it clear that it is the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that, as here, an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that Applicant has burden of proof in such cases as the above case law makes clear.

As to the grounds of rejection under section 103, see MPEP § 2113

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Victor A Mandala Jr. whose telephone number is (703) 308-6560. The examiner can normally be reached on Monday through Thursday from 8am till 6pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (703) 308-6601. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

VAMJ
10/19/03

